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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/401,676	09/22/1999	HENRY ESMOND BUTTERWORTH	UK999-027	4983

		EXAMINER
7590	02/02/2004	LAFORGIA, CHRISTIAN A

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ART UNIT	PAPER NUMBER
2131	14

DATE MAILED: 02/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

	Application No.	Applicant(s)
Office Action Summary	09/401,676	BUTTERWORTH ET AL.
	Examiner	Art Unit
	Christian La Forgia	2131

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 November 2003*.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☒ All b)☐ Some * c)☐ None of:

      1.☒ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application)
since a specific reference was included in the first sentence of the specification or in an Application Data Sheet.
37 CFR 1.78.

    a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific
reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.

4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1.   In view of the Appeal Brief filed on 14 November 2003, PROSECUTION IS HEREBY

REOPENED. New grounds of rejection are set forth below.

2.   To avoid abandonment of the application, appellant must exercise one of the following

two options:

        (1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37

CFR 1.113 (if this Office action is final); or,

        (2) request reinstatement of the appeal.

3.   If reinstatement of the appeal is requested, such request must be accompanied by a

supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or

other evidence are permitted. *** 37 CFR 1.193(b)(2).

4.   Claims 1 through 14 are presented for examination.

Claim Rejections - 35 USC § 103

5.   The text of those sections of Title 35, U.S. Code not included in this action can be found

in a prior Office action.

6.   Claims 1 through 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S.

Patent No. 4,980,820 to Youngblood, hereinafter Youngblood.

7.   As per claims 1, 5, and 10, Youngblood teaches a method for processing work items in a

data processing system comprising:

        generating an interrupt in response to receipt of a work item in the system (Figure 2

[block 50], 5-11; column 5, lines 32-36; column 7, lines 60-65; column 8, lines 27-32; column 8,

lines 47-53);

servicing the generated interrupt to schedule a task for later processing of the work item,

without re-enabling the interrupt (Figures 12-22; column 2, lines 65-67; column 3, lines 19-27;

column 9, line 62 to column 10, line 10; claim 1);

subsequently executing the task to process the work item (Figures 12-22; column 2, lines

65-67; column 3, lines 19-27; column 6, lines 18-48; column 7, lines 19-54; column 10, lines 5-

10); and,

speculatively scheduling a further task for processing of any work items that are

subsequently received in the system (Figures 3, 4; column 7, lines 19-54; column 8, lines 18-26).

It is a general function of processing systems to schedule work items for processing, as

processing systems are constantly receiving items to be executed there is a constant need to

schedule such items to be executed. Youngblood does not teach servicing the generated interrupt

to schedule a task for later processing of the work item, without re-enabling the interrupt. It

would have been obvious to one of ordinary skill in the art at the time the invention was made to

disable interrupts, since it is defined in Youngblood that the interrupt requests are to be held off

(disabled) for a minimum amount of time in order to service an interrupt request of equal or

higher priority.

8.   Regarding claim 2, Youngblood teaches executing the speculatively scheduled task to

process any work items received by the system (Figures 12-22; column 2, lines 65-67; column 3,

lines 19-27; column 6, lines 18-48; column 7, lines 19-54; column 10, lines 5-10);

on a determination that there are no work items to be processed, enabling the interrupt

(column 8, lines 18-26; column 9, line 63 to column 10, line 10; claim 1); and,

on a determination that there are work items to process, speculatively scheduling a further

task, without re-enabling this interrupt (Figures 3, 4; column 7, lines 19-54; column 8, lines 18-

26). Youngblood teaches in claim 1 and column 8 that the work items are directly related to the

interrupt requests, once all the work items are expended the system understands that the interrupt

has been satisfied, and is therefore ready to handle new interrupt requests thereby re-enabling

interrupts. Youngblood does not teach speculatively scheduling a further task without re-

enabling the interrupt. It would have been obvious to one of ordinary skill in the art at the time

the invention was made to disable interrupts, since it is defined in Youngblood that the interrupt

requests are to be held off (disabled) for a minimum amount of time in order to service an

interrupt request of equal or higher priority.

9.   With regards to claims 3 and 7, Youngblood teaches the work items are managed on a

queue (Figure 1 [block 46]; column 2, lines 48-67; column 6, lines 7-17).

10.   Regarding claims 4 and 8, Youngblood teaches an event that further work items are

received after the task is scheduled and prior to execution of the task, the step of executing the

task comprises processing all the received work items (column 3, lines 19-28; column 9, line 67

to column 10, line 10). Youngblood teaches the claimed invention except for processing all the

received work items when another task has been added to the queue. It would have been obvious

to one having ordinary skill in the art at the time the invention was made to process all the work

items on the queue, since it has been held that executing several work items at the same time

which had formerly been executed separately involves routine skill in the art. See *Howard v. Detroit Stove Works*, 150 U.S. 164 (1993); see also MPEP § 2144.04.

11.   Regarding claims 6 and 11, Youngblood teaches the processing means being operable on a determination that there are work items to be processed to execute the speculatively scheduled task to process the work items and to schedule a further speculative task (Figures 12-22; column 2, lines 65-67; column 3, lines 19-27; column 6, lines 18-48; column 7, lines 19-54; column 10, lines 5-10); and,

        operable on a determination that there are no work items to be processed to enable the interrupt (column 8, lines 18-26; column 9, line 63 to column 10, line 10; claim 1). Youngblood teaches in claim 1 and column 8 that the work items are directly related to the interrupt requests, once all the work items are expended the system understands that the interrupt has been satisfied, and is therefore ready to handle new interrupt requests thereby re-enabling interrupts.

12.   Regarding claim 9, Youngblood teaches the interrupt generating means and processing means are embodied in a data storage controller and the work items comprise data transfer requests from an attached host system (Figures 1 [blocks 36, 42, 43, 44], 2 [block 52, 53, 62], 5, 6, 11; column 4, lines 51-67; column 9, lines 36-50).

13.   As per claim 12, Youngblood teaches a new method of processing work items in a data processing system, comprising:

effectively providing an interrupt-based mechanism for processing work items, when the

system utilization is low with respect to work items (column 2, lines 48-60; column 3, lines 14-

27); and,

effectively providing a polling-based mechanism for processing work items, when system

utilization is relatively high with respect to work items (Figures 3 [block 66], 4; column 18-65;

column 11-54). It would have been obvious to one of ordinary skill in the art at the time the

invention was made to implement the interrupt-based mechanism with few work items queued

and the polling mechanism with many work items queued. With few items on the queue, the

interrupt mechanism would still handle work items. By using the interrupt mechanism there is

the potential that another interrupt may be generated and already have a work item relating to

that interrupt on that queue, thereby creating an efficient method of handling several work items

and satisfying more than one interrupt at a time. On the other hand, if there are a large number

of work items on the queue a polling mechanism would be more beneficial, as the polling

mechanism can select requests and handle said requests from devices that work items on the

queue could satisfy, thereby handling a plurality of interrupts simultaneously.

14.   With regards to claim 13, Youngblood teaches wherein work item are received in

accordance with at least one device driver associated with a host system (Figures 1 [blocks 39,

42, 43, 44], 5, 6, 8; column 4, lines 41-50).

15.   Regarding claim 14, Youngblood teaches wherein the data processing system comprises a

storage controller (Figure 1 [block 46]; column 6, lines 7-17).

Conclusion

16.   The prior art made of record and not relied upon is considered pertinent to applicant's

disclosure.

17.   The following patents are cited to further show the state of the art with respect to

interrupt-driven processing, such as:

United States Patent No. 6,169,929 to Izzo et al., which is cited to show a system for

polling for user interrupts.

United States Patent No. 5,606,703 to Brady et al., which is cited to show an interrupt

protocol system using priority arranged queues.

United States Patent No. 6,192,441 to Athenes et al., which is cited to show an apparatus

for postponing interrupts.

United States Patent No. 5,490,271 to Elliot et al., which is cited to show remote interrupt

processing.

United States Patent No. 5,931,936 to Chung et al., which is cited to show a multiple

interrupt controller.

18.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Christian La Forgia whose telephone number is (703) 305-7704.

The examiner can normally be reached on Monday thru Thursday 7-5.

19.   If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Ayaz Sheikh can be reached on (703) 305-9648. The fax phone number for the

organization where this application or proceeding is assigned is (703) 746-7240.

20.   Any inquiry of a general nature or relating to the status of this application or proceeding

should be directed to the receptionist whose telephone number is (703) 305-3900.

Christian LaForgia
Patent Examiner
Art Unit 2131

clf

AYAZ SHEIKH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100